

CLAIMS

1. A method for automatically modeling film grain patterns, comprising the steps of:

transforming a set of film grain samples to the frequency domain;

5 storing each set of coefficients resulting from such transform, the coefficients forming a pattern;

analyzing the pattern created by the transform coefficients; and

estimating the cut frequencies of a 2D band-pass filter that can effectively simulate the pattern of transform coefficients by filtering random noise in a frequency domain.

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2. The method according to claim 1 further comprising the step of transmitting at least one cut frequency in a Supplemental Enhancement Information message.

15 3. The method according to claim 1 wherein the film grain samples are processed in blocks of NxN pixels.

4. The method according to claim 3 wherein the step of analyzing the pattern created by the transform coefficients further comprises the steps of:

20 computing a mean block of NxN transform coefficients by averaging the transform coefficients from all the stored blocks;

defining horizontal and vertical mean vectors of N components each by averaging the mean block of NxN coefficients along rows and columns, respectively, of each transformed block;

representing the horizontal and vertical mean vectors as separate curves; and

25 establishing horizontal and vertical cut frequencies from the curves represented by the horizontal and vertical mean vectors, respectively.

5. The method according to claim 4 further comprising the step of low pass filtering at least one mean vector.

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-9-

6. The method according to claim 4 wherein the at least one cut frequency is established from an intersection point in the curve representing the mean vector.

7. The method according to claim 4 wherein each of a low and a high cut frequency is established from a first and second intersection points in the curve representing the mean vector.

8. The method according to claim 3 wherein the step of analyzing the pattern created by the transform coefficients further comprises the steps of:

10 computing a mean block of NxN transform coefficients by averaging the transform coefficients from all the stored blocks;

defining horizontal and vertical mean vectors of N components each by averaging the mean block of NxN transform coefficients along rows and columns, respectively, of each transformed block;

15 averaging the horizontal and vertical mean vectors into a single mean vector;
representing the mean vectors as a curve; and
establishing horizontal and vertical cut frequencies from the curve represented by the mean vector.

20 9. The method according to claim 8 further comprising the step of low pass filtering the mean vector.

10. The method according to claim 8 wherein at least one cut frequency is established from an intersection point in the curve representing the mean vector.

25 11. The method according to claim 8 wherein each of a low and a high cut frequency is established from a first and second intersection points in the curve representing the mean vector.

-10-

12. A method for automatically modeling film grain patterns, comprising the steps of:

receiving a set of film grain samples

performing a transform on the set of film grain samples to the frequency domain

5 storing each set of coefficients resulting from such transform, the coefficients forming a pattern;

analyzing the pattern created by the transform coefficients; and

estimating the cut frequencies of a 2D band-pass filter that can effectively simulate the pattern of transform coefficients by filtering random noise in a frequency domain.

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